

REMARKS

The Office Action of April 9, 2003 has been received and its contents carefully reviewed. Applicant would like to thank the Examiner for the consideration given to the above-identified application.

By this Amendment, claim 1 has been amended and claims 2-9 are withdrawn. Accordingly, claim 1 is pending for consideration. Applicant respectfully requests reconsideration and allowance of all the pending claims.

Turning to the Office Action, claim 1 stands rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,235,633 to Jang. In view of the amendments above and the comments provided below, Applicants respectfully traverse these rejections.

The Jang patent is directed to a method for forming a hard mask layer 22 on an interlayer insulating film 20 having a low dielectric constant, and thereafter forming contact openings 2 by using the hard mask layer 22 as a mask. More specifically, the hard mask layer 22 is formed with a tapered shape and the contact openings 2 are filled with tungsten 28. Thereafter, the tapered portion of the hard mask layer 22 is removed.

In contrast, the present invention is directed to a method for manufacturing a semiconductor device which comprises (a) depositing an interlayer insulator film on a substrate including a plurality of conductive layers, (b) fanning a plurality of contact holes running through the interlayer insulator film to reach respective ones of the plurality of conductive layers by etching each of the contact holes having a tapered portion at an upper end of the interlayer insulating film and the intervals between the contact holes are irregular, (c) depositing a conductive material film on the interlayer insulator film so as to fill the plurality of contact holes, (d) removing the conductive material film until a surface of the interlayer insulator film is exposed so as to form a plurality of plugs made of the conductive material film filling the plurality of contact holes, and (e) removing a portion of the interlayer insulator film, which has been exposed in the step (d), so as to remove the tapered portions. Applicant respectfully submits that Jang does not teach or suggest this combination of features.

For example, Applicant respectfully submits that also Jang fails to disclose each of the contact holes having a tapered portion at an upper end of the interlayer insulating film, as currently recited in independent claim 1. Initially, Applicants note that contact holes 2, running through the interlayer insulating film of Jang, are not tapered at an upper end of the

interlayer insulating film. In the Office Action, the Examiner asserts that both the interlayer insulating film 20 and the hard mask layer 22 in Jang are interlayer insulating films. However, Applicants respectfully submit that this interpretation is incorrect. More specifically, the hard mask layer 22 is only used as an etching mask for forming the contact openings 2 and is not retained as an insulating film between the interconnect layers. Moreover, Jang does not disclose or suggest that the hard mask layer 22 is an interlayer insulating film. In other words, according to the method of Jang, a tapered portion is formed in the hard mask layer 22, but no tapered portion is formed at the upper end of the interlayer insulating film.

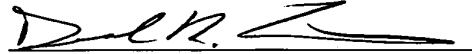
Additionally, Applicants respectfully submit that Jang does not teach or suggest that the intervals between the contact holes are different, as now set forth within independent claim 1. As illustrated in Fig. 1B and 1D of the present specification, by forming tapered portions in the contact holes, even if the upper portions of the adjacent contact holes 7 are connected to each other at the narrow region in-between, short circuit of the plugs buried in the contact holes cannot be prevented by removing the tapered portion of the contact holes using the inventive claim 1 method.

Jang, on the other hand, teaches contact openings that are formed at regular intervals. In this case, as shown in Fig 3 of Jang, the depth of the tapered portion of each contact opening formed in the hard mask layer 22 will be the same. Thus, if the tungsten 28 filling the contact openings is being removed until the surface of the hard mask layer 22 is exposed, all the contact openings will be separated from each other and a short circuit of the plug can be prevented. For the foregoing reasons, Applicant respectfully submits that amended claim 1 of the present invention is patentable over Jang. Thus, for at least the above-noted reasons, Applicant respectfully requests reconsideration and withdrawal of the rejection.

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Should the Examiner believe a conference would be of benefit in expediting the prosecution of the instant application, he is hereby invited to telephone counsel to arrange such a conference.

Respectfully submitted,



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